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Correspondence between the Board of Trade and the Royal Society in reference to the Meteorological Department*.

From T. H. Farrer, Esq., Marine Secretary of the Board of Trade, to General Sabine.

“Board of Trade, Whitehall,
26 May, 1865.

“SIR,—I am directed by the Lords of the Committee of Privy Council for Trade, on the occasion of the vacancy in the Office of Chief of their Meteorological Department, caused by the untimely death of Admiral FitzRoy, to request you to be so good as to bring under the notice of the President and Council of the Royal Society the correspondence which took place between that Society and this Office at the time of the institution of the Meteorological Department as a branch of this Office; and particularly your letter of the 22nd February, 1855†, in reply to that from this Office of the 3rd of June, 1854, in which, when about to institute the Department, My Lords had desired the opinion of the Royal Society as to what were the great desiderata in Meteorological Science. The recommendations of the Royal Society conveyed in your letter of the 22nd of February, 1855, were adopted as the basis of the proceedings of the Meteorological Department; instruments were provided, logs were prepared, furnished, and returned to the office, and some progress was made in carrying into effect the original programme.

“But in 1859 or 1860, the French Government having adopted a system of telegraphing and publishing the actual state of weather from one place to another, cooperation in which was urged on the Board of Trade by a Committee of the British Association and by Admiral FitzRoy, My Lords gave their sanction to what was proposed, and thenceforward a considerable part of the vote previously applied to obtaining and digesting observations was diverted to these Telegrams. In 1861 Admiral FitzRoy grafted on this system of telegraphic communication a system of forecasting the weather (the forecasts being published in the daily papers), and, on occasions of anticipated storms, the giving of special warnings, communicated by telegraph to the different Ports, and there made known by hoisting certain signals. The whole, or almost the whole, of the Funds originally voted for the purpose of observations were thus diverted from their original scientific object to an object deemed more immediately practical.

“In 1863, on the occasion of an increased estimate for the purpose of these forecasts, it was determined to compare the forecasts and the warnings with the actual results.

“As regards the daily forecasts, the daily reports of weather published by Admiral FitzRoy afforded, and still afford, ample means of checking them.

“As regards the storm-warnings, detailed reports were called for from

* Published by order of the Council.

† Proceedings, vol. vii. p. 342.

the places to which the warnings were sent. The results of these comparisons for certain periods were tabulated and laid before Parliament in a paper, copy of which is annexed. The data for continuing the return are still kept, and, if it were thought right to incur the expense, it could be continued at any time.

“My Lords at the same time addressed a further letter, dated 27th February, 1863, asking the opinion of the Royal Society as to the course then being pursued by Admiral FitzRoy, and were favoured in reply by your letter of the 27th March, 1863.

“The vacancy in the Meteorological Department, occasioned by the death of Admiral FitzRoy, has seemed to My Lords to present a fitting opportunity to review the past proceedings and present state of the Department; and with this view they are desirous of receiving any observations or suggestions, with which the President and Council of the Royal Society may be willing to favour them, on the constitution and objects of the Department, and the mode in which those objects may be most effectually attained.

“The points on which the Board of Trade especially desire the opinion of the Royal Society are the following:—

“1. Are the objects specified in the Royal Society’s letter of the 22nd February, 1855, still as important for the interests of Science and Navigation as they were then considered?

“2. To what extent have any of these objects been answered by what has already been done by the Meteorological Department?

“3. What steps should be taken for making use of any observations already collected, or any compilations already made by the Department?

“4. Is it desirable to make any, and what, further observations on any, and which of the subjects mentioned in the Royal Society’s letter of 22nd February, 1855?

“5. What is the nature of the basis on which the system of daily forecasts and storm warnings established by Admiral FitzRoy rests? In other words, are they founded on scientific principles, so that they, or either of them, can be carried on satisfactorily notwithstanding Admiral FitzRoy’s decease?

“6. If they, or either of them, can be carried on satisfactorily, can the Royal Society suggest any improvement in the form and manner of doing it?

“7. Is it desirable to continue down to the present time the tables of results corresponding to the forecasts and storm warnings which were made out for certain periods in the year 1863, and were presented to Parliament in April 1864 (Parliamentary Paper, No. 200, Session 1864, inclosed)? The materials for doing this exist in the Office, and only require clerical labour.

“8. Assuming it to be desirable to continue the publication of the daily reports of weather received from various stations, can the Royal Society

make any suggestions as to the extent to which it should be carried, and the form in which it should be done ?

“9. Have the Royal Society any general suggestions to make as to the mode, place, or establishment in, at, or by which the duties of the Meteorological Department can best be performed ?

“With respect to these heads of inquiry, My Lords desire to observe, in the first place, that they understand that the Admiralty are willing to undertake, and to place in the hands of their Hydrographer, all those observations which can properly be made use of in framing charts for purposes of Navigation, but not those which relate to Meteorology proper.

“Secondly. That the Board of Trade will gladly place the knowledge and services of Mr. Babington, Admiral Fitzroy’s second, at the disposal of the Royal Society, for the purpose of the above inquiries, and will also give them any help, clerical or otherwise, which the Royal Society may require, and which the Board of Trade may be able to give.

“I have the honour to be,

“Sir,

“Your obedient Servant,

“T. H. FARRER.”

“*The President of the Royal Society.*”

Report by Mr. Babington on Forecasts and Storm-warnings, communicated with Mr. Farrer’s Letter.

“Meteorological Department,
May 11, 1865.

“The following is an attempt to comply with a request from Mr. Farrer for some explanation, in a few words, of the method adopted in this Department with regard to Forecasts and Storm Warnings—the basis on which forecasts have been made and cautions given.

“Admiral FitzRoy has devoted three chapters (XIII., XIV., XV.) of his ‘Weather Book’ to this particular subject. I do not think the matter can be thoroughly comprehended without reference to those chapters. The very brief explanation which follows here must necessarily be most incomplete.

“About ten o’clock each morning (except Sundays) telegrams are received here from about eighteen places round our own coasts, from a few French ports, and from Heligoland. These telegrams report (in cipher, for brevity) the state of the atmosphere, including pressure, temperature, wind direction and force, degree of dryness, rainfall, state of sky and sea, at each station.

“The observations thus telegraphed are immediately reduced, or corrected, for scale-errors, elevation, and temperature, and are written into prepared forms.

“The first copy, with all the telegrams, is passed to the chief of the department, or the person appointed by him, to be studied for that day’s

forecasts. At eleven, copies of the report, with forecasts, are sent out to 'The Times' (for second edition), to the 'Shipping Gazette,' and to the principal afternoon papers. Copies of the forecasts, only so far as they relate to weather expected in the Channel and on the French coasts, are telegraphed to Paris (by special request) for the Ministry of Marine. The whole of this work is finished by about half-past eleven, when every one in the department is free to turn his attention to other duties. Late in the afternoon telegrams are received from a very few selected stations. Should it appear necessary (which is now but seldom), in consequence of this later information, the morning's forecasts are more or less modified, and copies of the report are sent out for the next morning's early papers.

"Besides this daily service, *occasional* storm warnings, or cautions, are sent to our own coasts and to Paris, and, when it appears advisable, also to Hamburg, Hanover, and Oldenburg, by the request *and at the expense* of the Governments of those States.

"The basis upon which the forecasts and the cautions (which are merely forecasts symbolized) are founded, may be stated briefly as follows:—

"They are the result of theory and experience combined. They are not *predictions* but *opinions*, although probably the *best* opinions that can be formed; for it is manifest that if we know what is and *has* been occurring around an area several hundred miles in diameter, we are in a better position to form an opinion respecting the probable weather in a particular district than any person who has not such facts at command.

"Considering, with Dove, that there are two constant principal wind-currents, north-east and south-west, of which the characteristics, especially with regard to temperature and degree of moisture or dryness, are totally distinct, all varieties of wind and weather in these latitudes may be traced to the operation of these two main currents—singly, in combination, or in antagonism—at times running in parallel lines but in opposite directions, frequently *superposed*, and occasionally meeting at various angles of incidence.

"Upon the relative prevalence or failure of either or both of these currents all conditions of weather appear to depend.

"It is clear that changes must begin at some places earlier than at others; and the observations telegraphed daily to this department from the outports afford the means of forming a very good opinion respecting the nature and probable course of such changes. In a paper of this kind one or two examples must suffice, although the various examples that might be given are numerous, as also are the disturbing causes which must be taken into account by a *Forecaster*.

"Suppose a northerly (E.N.E.—N.N.W.) current to have been prevailing generally over this country with *fine* weather; the barometers at all the outports, during the continuance of such weather, will have been steady, or slowly rising, nearly uniform, or slightly higher at the northern than at the southern stations; there will have been much evaporation, and

the sky will have been comparatively clear and free from cloud, while the temperatures, when free from the influence of radiation, will have been somewhat below the average.

“Suppose now the northern barometers rise rapidly above the average, while the temperature remains low and the sky clear. This is an indication of *more* wind from a northern quarter, but probably without rain. Should, however, the southern barometers fall at the same time, while the temperatures in the south are much higher than in the north, the wind will probably increase to a *gale* from a northern quarter, and a sudden chilling of the atmosphere in the south will ensue, causing rain.

“The first approach of a southerly current is usually indicated by a diminution of pressure (falling barometers) in the north and west, caused by a failure of the polar current; the upper clouds are seen to be passing from the south, and the temperature increases.

“Occasionally a temporary failure of both currents takes place. We may have very low barometers, but for a day or two little or no wind. Such a state of things, however, never continues long. It is then especially necessary to watch for the first signs of approaching wind. The first indication is usually an *increase* of pressure in the direction from which the wind is coming. Should the French barometers rise rapidly or stand (say) an inch higher than in Scotland, the result will be a gale from the southward. Should *both* the French and the Scotch barometers rise rapidly, while in Ireland and central England the pressure continues very low, we may feel sure that *both* currents are approaching in force, and that the collision will be violent, causing much rain, and (according to the angle of incidence) either south-west and north-west gales, or a cyclonic movement, which experience has shown will probably advance in an easterly or north-easterly direction. On the other hand, should the increase of pressure be gradual and general, the combination of the two currents will be gradual also, and, though there may be rain, the winds will not be violent.

“There are a few grand rules, which, though not always free from disturbing causes, may be considered as generally holding good.

“1st. The essentially distinct characteristics of the two main currents should never be forgotten.

“2nd. The direction of wind is *usually* from the place of high barometer towards the region of low barometer.

“3rd. The *force* of wind is usually proportional to the *differences* of barometric pressure, *not* (as has been asserted by some) to the actual pressure. It matters little how low the barometer may be, if it is equally low for a considerable distance around. In such a case wind cannot follow at once, for there is no available supply at hand.

“4th. It was believed by Admiral FitzRoy that there exists a lateral transference of the whole body of atmosphere eastward.

“Electrical and auroral occurrences should be carefully watched; and the influence of high land, &c., must be borne in mind.

“There is another point in connexion with forecasting in which Admiral FitzRoy took great interest, namely, the frequency with which important atmospheric disturbances have been preceded by disturbances on electric wires above ground, and also on *submarine* wires.

“No argument, or opinion, with regard to the advisability or otherwise of the continuance of the present system of forecasting is offered here, because none was asked for. I may mention, however, that the system, though at first objected to at the Paris Observatory, has *since* been adopted at that place, but that nevertheless the *London* forecasts are still sent daily to the French Ministry of Marine at the request of that department.

“T. H. B.”

From General Sabine to Mr. Farrer.

“Royal Society, Burlington House,

“June 15, 1865.

“SIR,—In replying to your Letter of the 26th of May, the President and Council think it may be desirable to advert in the first instance to that which has constituted the chief occupation of Admiral FitzRoy’s Department in the last four or five years, viz., the systematic forecasting of the weather by means of telegrams received from stations comprised within a certain limited area, and, on occasions of anticipated storms, the giving special warnings conveyed by telegraph to the different ports in the United Kingdom, and there made known by hoisting certain signals.

“The system of forecasting which Admiral FitzRoy instituted and pursued has been expressly described by himself as ‘an experimental process,’ based on the knowledge conveyed by telegraph of the actual state of the winds and weather and other meteorological phenomena within a specified area, and on a comparison of these with the telegrams of the preceding days, so as to obtain inferences as to the probable changes in the succeeding days. The proper test of the efficiency and usefulness of such a system of cautionary signals at the different ports is to be sought in the *measure of success which it appears to have attained*—always remembering that the system under consideration can only be regarded as in its infancy, and that, if continued, its improvement, and consequently its importance, may be expected to be progressive from year to year. In Admiral FitzRoy’s Report to the Board of Trade in May 1862, the opinions of the ship-masters at several ports in regard to the practical value which they attached to the storm-signals were given at length. Of the 56 replies published in the Appendix of that Report, 46 were decidedly favourable, 3 decidedly unfavourable, and 7 expressing no decided opinion. A statement so favourable on the whole, obtained so very shortly after the system had been first brought into operation, must surely be considered to have fully justified the Board of Trade in directing its further prosecution.

“The return to the House of Commons, dated April 13th, 1864, a copy of which accompanied your letter, presents a comparison of the probable force of the wind as indicated by the signals in the year commencing

April 1st, 1863, and terminating March 31st, 1864, and its actual state, as reported in the three days following the exhibition of the signals; and Mr. Babington has since been so obliging as to communicate in manuscript a return having the same object in view for the year April 1st, 1864, to March 31st, 1865.

“From the first of these documents, the President and Council learn (in p. 7) that the whole number of signals which were hoisted at different places, and of which reports were received, between April 1, 1863, and March 31, 1864, amounted to 2288; of these the number which proved correct in respect to the *Force* of the wind equalling or exceeding ‘a fresh gale,’ was 1284; in 462 cases the stations were reached by the gale (or a still stronger wind blew) before the signal was hoisted; and in 726 within forty-eight hours after the signal was hoisted. Hence we may conclude that (omitting the 96 cases in which the gale occurred between 48 and 72 hours after the signal was hoisted) 1188 signals, or more than half the whole number of 2288, were justified by the state of the weather, either when the telegraphic message reached the station, or within forty-eight hours afterwards.

“With respect to *direction* of wind in a gale indicated by signal, the ‘warnings’ are reported to have been much less frequent. Of the 402 signals indicating direction as well as force, 271 agreed, and 131 did not agree with the real direction of the wind—being a proportion of about two correct to one incorrect.

“The manuscript with which Mr. Babington has favoured the Council since the receipt of your letter of May 26, 1865, contains a summary of the cautionary signals between April 1, 1864, and March 31, 1865, with notes stating their success or failure. From these it appears that signals were hoisted on 40 days in the course of the year, 29 of which appear to have been justified by the event, 8 to have been failures either in respect to force or direction, and 3 were late, the gale having already commenced. There are also 5 cases in which it is admitted that signals might have been made with advantage when none were sent.

“It seems not unreasonable to attribute to increased experience the marked improvement of these results upon those of the preceding year, and to anticipate still further improvement.

“The method adopted in preparing the storm-warnings has been very ably and lucidly explained by Mr. Babington in a paper dated May 11, 1865, presented by him to Mr. Farrer, by whom a copy has been sent to the President and Council. Possibly it may be viewed as the best arrangement that this branch of the duties of the office should continue as at present under the direction of Mr. Babington, by whom it has been virtually carried on for several months past.

“On the subject of storms of a cyclonic character originating in the British Islands or in their vicinity, the interest of which was adverted to in the reply from the Royal Society to the Board of Trade, March 27, 1863,

reference has been made to Mr. Babington for such further information as may have been subsequently obtained. His reply to General Sabine is as follows :—

“‘I can quite confirm your impression respecting Admiral FitzRoy’s belief in the evidence of the existence of small cyclonic storms in England itself, originating in or near our islands, and generated in the brushing against each other of the N.E. and S.W. currents; and in reply to your question I beg to say that I believe there is satisfactory evidence of the existence of such storms, but that these small storms are not very frequent—three or four in a year perhaps—and that they are, I think, more common in summer than in winter, although usually of less violence. The *direction* of their motion is certainly almost invariably towards some point between N.N.E. and E.S.E. With regard to the rapidity of their motion, I scarcely feel able to express an opinion; but at the ordinary rate of progression it takes such a storm about forty-eight hours to pass from Ireland to the Baltic. Not unfrequently, however, they appear to die out (as it were) before travelling so far.’

“The existence of such storms in our islands is a fact in meteorological science of considerable interest, for which we are indebted to the researches instituted and carried on by Admiral FitzRoy’s department. Though not of very frequent occurrence, they constitute a class of phenomena well suited for telegraphic advertisement, especially on our eastern and north-eastern coasts. It might perhaps be practically desirable to indicate them by a special signal, distinguishing them from storms which have a more uniform direction. But however this may be, it seems to be desirable that the occurrence of such storms and their attendant phenomena, as obtainable at the time, should be carefully recorded, with a view to the records being ultimately put together in elucidation of a branch of the meteorology of our islands which has hitherto been but imperfectly examined.

“We proceed to notice the points on which we are informed that the Board of Trade especially desire the opinion of the Royal Society—and particularly the inquiry whether the objects specified in the Royal Society’s letter of the 22nd of February 1855 are still viewed as of the same importance for the interests of science and navigation as they were then considered.

“The most prominent amongst these objects was the collection and co-ordination of meteorological observations made at sea, including such as are required to form a correct knowledge of the currents of the ocean, their direction, extent, velocity, and the temperature of the surface water relatively to the ordinary ocean temperature in the same latitude, together with the variations in all these respects which currents experience in different parts of the year and in different parts of their course. These—as well as the facts connected with the great barometric elevations and depressions which we know to exist in several oceanic localities, and their influence on circumstances affecting navigation—were noticed as inquiries well de-

serving the attention of a country possessing such extensive maritime facilities and interests as ours, and as forming a suitable contribution on our part to the general system of meteorological inquiry which had been adopted by the principal continental states in Europe and America.

“We have learnt from Mr. Babington that much was done by Admiral FitzRoy in the three or four years succeeding the establishment of his office (and before the subject of storm-warnings had engrossed the greater part of his consideration), in directing the attention of many of the commanders of our merchant ships to the collection of suitable data, and in improving their habits of observation and of record. The logs of such vessels form at present a large collection of documents existing in the Office of the Board of Trade, partially examined, and their contents partially classified. The President and Council are glad to learn by your letter that the further prosecution of this great and important branch of Hydrography is about to be placed in the hands of the distinguished officer who now presides over the Hydrographic Department of the Admiralty; to whose duties it appears indeed most appropriately to belong, and to whose office no doubt the documents already collected will be transferred and made available for public purposes.

“There remain, therefore, to be noticed solely the considerations which relate to ‘Meteorology proper,’ *i. e.* to the Land Meteorology of the British Islands. We find that the principal States of the European continent have almost without exception formed establishments for the collection and publication periodically of the meteorology of their respective countries. The arrangements consist usually of a central office, at which instruments and instructions are provided for a number of stations, greater or less, according to the area which they represent; at which stations observations are made and transmitted to the central office, where the results of all are reduced, coordinated, and published. The small extent of the area comprised by the British Islands in comparison with the territories of many of the European States, may require *fewer* stations; but in a matter now so generally attended to and provided for, it seems scarcely fitting that our country should be behind others. There is, moreover, a peculiarity in the meteorological position of the British Islands in respect to Europe generally as its north-western outpost, in consequence of which an especial duty appears to devolve upon us. M. Matteucci, in a very recent publication, has already made the important remark that extensive atmospheric disturbances which first invade Ireland and England are those which, in winter more especially, extend to and pass the Alps (although somewhat retarded by them), and spread over Italy—and thus that, though receiving telegrams announcing storms taking place in the North of Europe, in Germany, on the western coasts of France, and of those of Spain, he finds that it has in fact been most especially in the case of announcements from England that storms so telegraphed have actually

reached Italy, and been found to correspond with the accounts subsequently received from Italian Mediterranean ports.

"A few stations,—say six, distributed at nearly equal distances in a meridional direction from the south of England to the north of Scotland, furnished with *self-recording* instruments supplied from and duly verified at one of the stations regarded as a central station, and exhibiting a *continuous* record of the temperature, pressure, electric, and hygrometric state of the atmosphere, and of the force and direction of the wind—might perhaps be sufficient to supply authoritative knowledge of those peculiarities in the meteorology of our country which would be viewed as of the most importance to other countries, and would at the same time form authentic points of reference for the use of our own meteorologists. The scientific progress of meteorology from this time forward requires indeed such continuous records, first, for the sake of the knowledge which they alone can effectively supply, and next, for comparison with the results of independent observation not continuous. The actual photographs, or other mechanical representations, transmitted weekly by post to the central station would constitute a lithographed page for each day in the year, comprehending the phenomena at all the six stations, each separate curve admitting of exact measurement from its own base-line, the precise value of which might in every case be specified.

"The President and Council suggest that the Observatory of the British Association at Kew might, with much propriety and public advantage, be adopted as the central meteorological station. It already possesses the principal self-recording instruments, and the greater part of them have been in constant use there for many months. There will be no difficulty in obtaining, through the intervention of the Committee of Management, similar instruments for the affiliated meteorological stations, and in arranging for their verification and comparison with the Kew standards, as well as in giving to those in whose hands they may be placed such instructions as may ensure uniformity of operation. The records from the other stations may be received at Kew by post weekly, or more frequently if required, and may be at once arranged for such form of publication as may be most approved. It seems expedient that, if practicable, the stations which should be selected to act in concert and cooperation with Kew should be in localities where some permanent establishment of a scientific character exists, and where a certain amount of supervision may be secured. In this view the President and Council would suggest, as eligible, the following chain of stations, commencing from the south, viz. :—

Falmouth—Polytechnic Institution	Lat.	50	9
Kew—Observatory of the British Association	„	51	28
Stonyhurst—The College, which has already a magnetical and meteorological observatory	„	53	0
Armagh—Observatory	„	54	21

Glasgow—University and Observatory Lat. $55^{\circ} 51'$

Aberdeen—University „ $57^{\circ} 9'$

“To these six stations the President and Council would have been very glad to have added two others, one in the south-west and one in the north-west of Ireland. For the former of these, possibly Valentia may present a fitting locality, when an establishment shall have been formed there as the connecting link, by means of the Atlantic Telegraph between Europe and America.

“Having answered thus generally, it may perhaps be desirable to add specific replies on the several points enumerated in Questions 1 to 9. Preserving the order in which the inquiries are made, the replies are as follows :—

“*Question 1.* The President and Council are of opinion that the objects specified in the Royal Society’s letter of February 22, 1855, are as important for the interests of science and navigation as they were then considered.

“*Question 2.*—Much has without doubt been accomplished in the collection of facts bearing on Marine Meteorology, but as no systematic publication of the results has yet been made, the President and Council are unable to reply more specifically.

“*Question 3.*—The President and Council recommend that the Sea Observations should be placed in the hands of the Hydrographer, with a view to the introduction of the results into the Admiralty Charts. They, however, at present have not sufficient information on the subject of the Land Observations which may exist in the office of the Board of Trade to justify them in offering any recommendation thereon.

“*Question 4.*—The President and Council consider it very desirable that further observations should be made, especially with reference to oceanic currents and great barometric depressions, and generally on all subjects comprehended under the denomination of ‘Ocean Statistics.’

“*Questions 5 & 6.*—It appears from the late Admiral FitzRoy’s reports, as well as from the explanations of Mr. Babington, that the storm-warnings have been based on inferences drawn from observations extending over a considerable area; and the President and Council recommend that they should be continued under the superintendence of that gentleman. Respecting the daily forecasts of weather, however, they decline expressing any opinion.

“*Question 7.*—The President and Council are of opinion that it would be desirable that an annual report in a modified form should be made to the Board of Trade of the results from the storm-warnings in the preceding year, and should be communicated to Parliament, and thereby become known to the public.

“Question 8.—A proper reply to this question would require information and involve considerations which would occasion an inconvenient delay in the transmission of this letter.

“Question 9.—The suggestions of the President and Council in regard to the mode in which it appears to them that the important subject of ‘Meteorology Proper,’ or the ‘Land Meteorology of the British Islands,’ might be dealt with economically, and at the same time effectively, have been fully stated in the body of this letter.

“I have the honour to be, Sir,

“Your obedient Servant,

“EDWARD SABINE,

“President of the Royal Society.”

Extracts from a Letter to the President from Professor Dove, of Berlin, dated June 12th, 1865.

“Berlin.

“My views respecting the way in which meteorological communications may be made available for practical use in storm-warnings are in general accordance with the methods followed in England ; yet I acknowledge that I do not trust myself to announce daily probabilities, at least with the but limited communications which reach *me* telegraphically. My investigations in regard to storms have hitherto had relation to great atmospheric disturbances in autumn and winter, hardly at all to the storms of summer, in which the derangements of atmospheric equilibrium are much more local, and therefore the limits of the region overspread by the storm much narrower. This is particularly true of the storms of the Baltic. There, relative barometric minima occur, which seem to be cut off as it were towards the south. Probably the upper equatorial current first comes down in those high latitudes, breaking into the locally warm moist air, and occasioning a north-west wind at the south end of the Scandinavian mountain ranges, over the Kattegat and the lowlands of Denmark. Yet it is probable that these disturbances are less local than they may seem to the inhabitants of Western Europe, for they extend into the interior of Russia, and may become more intelligible when viewed in combination with telegraphically communicated data from Russia. All this must be studied if too hasty conclusions are to be avoided.

“We have introduced the English warning-signals into our Baltic ports. We leave to authorities at the ports who are conversant with the subject a discretionary power of showing warnings, in so far as they may be able to form a judgment from the telegrams which we send them of our observations here, and the general appearance of the sky, &c., viewed in connexion with the whole local character of the weather ; but it is imperative on them to hoist a signal when an actual storm-warning is telegraphed from Berlin. I wished to introduce the system gradually. I consulted with Kupffer, who had similar views. His death is a new misfortune, following so shortly the loss of Admiral FitzRoy, to whom I owed great thanks for

much kindness. Also I had concerted with Kupffer and Plantamour for attending the Swiss Scientific Meeting at Geneva at the end of August, and inviting the heads of the different systems of observation to assemble there, and consult in common as to the best modes of treatment, communication, and publication. This must, no doubt, now stand over. As to the data to be communicated, it is no doubt right to give, as now, the height of the barometer at the moment the telegram is despatched; but I think it would be desirable to add a sign indicating whether the barometer is rising or falling. The cotemporaneous temperature is in many cases desirable, and thus I think that this communication might be so arranged that some scientific result could be based thereon. If the maximum and minimum of the preceding day had heretofore been telegraphed, we should have gained six or seven years' materials for enabling us to judge whether the day of the telegram was a relatively warm or cold one. The same hour has in the diurnal variation a very different meaning in different parts of the year; and in the summer months it is difficult to draw any definite conclusions from the temperatures at seven or eight o'clock. It seems to me, moreover, that in the present modes too little consideration is given to first laying down what it is desired to obtain. For England, for instance, the reduction of the barometer to the level of the sea is not difficult; but yet there are many land-stations in which one does not know whether this reduction has been made or not. Advances in meteorology are based on long-continued labours: we seem now to want to take it by storm; this may dazzle the public, but the results need control if they are to be recognized as really such:

"The idea that all storms are cyclones is indeed given up by most, and I have lately been taking some pains to contribute thereto. The introduction of the word 'cyclonoid' means nothing more than that for a given case it is wished to leave the matter undecided. It is a retrograde step.

"I have read with great interest the paper headed 'Forecasts and Cautions' kindly sent to me. It seems to me very suitable to the desired end. I cannot recognize any connexion with electrical currents; I cannot discern any proper bases for doing so.

"For meteorology itself, I should deem it extremely advantageous if, as you contemplate, the immediate data of observation in England were placed under a common guidance such as that of the Kew Observatory. The British Association does indeed represent in the freest and most independent manner scientific Great Britain as a whole. I do not certainly recognize what the British and Scottish Meteorological Societies have supplied in this direction; but an accordant mode of publication and treatment would still give quite other results. So, for example, in the monthly communications the notice of the date of their occurrence is wanting. These are the very things by means of which it is possible to examine profitably the particular phenomena of a storm.

“The small pecuniary resources of our Meteorological Institute, which now includes ninety-seven stations, do not permit me to publish the daily means. I have therefore had to content myself with five-day means ; but I think that by the consequent calculation of deviations I have brought some questions nearer to a solution. But I have to do this work by myself, and, overcharged as I am besides with official duties, I do not think I shall long be able to continue to master it. The resources which the British Association offers to all scientific undertakings in England will make it possible for you to establish in a thorough manner the constants of a climatology of England, and to investigate on this climatological basis the meteorology of England.

“I had long proposed to myself to write from my own point of view a pamphlet ‘how to observe’ in meteorology ; but when one has, as I have constantly, to give lectures in the day, and hold examinations in the evening till nine o’clock, much that has been contemplated is left undone. . . . In regard to telegraphic communications, Admiral FitzRoy once said to me that reports from Eastern Europe were of little interest for England. This may be granted where it is question of the storms which assail the English and Irish coasts themselves. But the commerce of the Baltic is for the greater part in the hands of Englishmen, and I think that it would therefore be conducive to English interests also if the efforts were facilitated which are made by others to lessen the dangers to shipping in the Baltic. As it is precisely north-west storms which are the most dangerous in that sea, communications from England are wanted for this. Among the numerous telegraphic communications received here daily, there are none from England. Would it not be possible to arrange an exchange, if only for one or two stations ? The communication might be made through Tönningen, by the cable, so as to avoid the German-Austrian Telegraph Company, which declines to afford a gratuitous passage for our messages.

“Harbour signal arrangements are now established at Memel, Pillau, Neufahrwasser, Stolpemünde, Rügenwalde, Colbergermünde, Swinemünde, Greifswald, Stralsund, and Barth.”

June 15, 1865.

Major-General SABINE, President, in the Chair.

The Rev. W. R. Dawes, Mr. George Gore, Dr. George Harley, Mr. W. Huggins, Mr. Fleeming Jenkin, and Mr. W. K. Parker, were admitted into the Society.

The following communications were read :—